Paper No. 32

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte
TOMIO SUGIYAMA,
HIROMI SANO,
MASAHIRO SHIBATA,
and SYUICHI NAKANO

Appeal No. 2002-1284
Application No. 09/098,730

ON BRIEF

Before OWENS, LIEBERMAN and MOORE, Administrative Patent Judges.

LIEBERMAN, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the decision of the examiner refusing to allow claims 1, 2, 4, 6, 7, 10, 11, and 18 through 22 as amended subsequent to the final rejection which are all the claims pending in this application.

THE INVENTION

The invention is directed to a multilayered air fuel sensor having a plurality of substrate layers, at least one solid electrolyte layer and at least one insulating layer. The boundary layer has an average sintered particle size larger than both the solid electrolyte layer and the insulating layer. Additional limitations are described in the following illustrative claim.

THE CLAIM

Claim 1 is illustrative of appellants' invention and is reproduced below.

1. A multilayered air-fuel ratio sensor having a plurality of stacked layers comprising:

a plurality of substrate layers comprising at least one solid electrolytic substrate layer and at least one insulating substrate layer; and

a boundary layer interposed between said solid electrolytic substrate layer and said insulating substrate layer;

wherein said boundary layer has an average sintered particle size that is larger than that of said solid electrolytic substrate layer and that is larger than that of said insulating substrate layer.

THE REFERENCES OF RECORD

As evidence of obviousness, the examiner relies upon the following references:

Suzuki et al. (Suzuki)	4,177,112	Dec. 4, 1979
Mase et al. (Mase)	4,861,456	Aug. 29, 1989

THE REJECTIONS

Claims 1, 2, 4, 6, 7, 10, 11, and 18 through 22 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Mase in view of Suzuki.

OPINION

We have carefully considered all of the arguments advanced by the appellants and the examiner and agree with the examiner that the rejection of the claims under §103(a) is well founded. Accordingly, we affirm the rejection.

As an initial matter, it is the appellants' position that, "[a]ll claims stand or fall together." See Brief, page 4. Accordingly, we select claim 1, a broad generic claim as representative of the claimed subject matter and limit our consideration thereto. See 37 CFR §1.192(c)(7) (2001).

The Rejection under § 103(a)

It is the appellants' position that, "the combination of Mase and Suzuki does not appear to yield the claimed invention." See Brief, page 6. We disagree.

We find that Mase is directed to an oxygen sensor utilized to determine the concentration of an exhaust gas from internal combustion engines of automobiles. See Mase, column 1, lines 14-18. We find that Mase teaches layers corresponding to the claimed boundary layers which are preferably ceramic layers of alumina or spinel which is preferably porous. See Answer page 3, and column 6, lines 50 to column 8, line 38 of Mase.

In the rejection before us a basic finding of the examiner is that, "[i]t is common knowledge that a solid electrolyte is non-porous. Otherwise, a measurement gas and a reference gas on opposite sides of the electrolyte layer would intermingle and defeat the operational principle of the sensor. Note that in figures 5 and 7 of Mase, a measurement gas passes into contact with measuring electrode 58 on one side of solid electrolyte layer 56, while a reference gas passed into contact with reference electrode 64 on the opposite side of the solid electrolyte. See col. 8, lines 42 to col. 10, line 4 of the patent. Similarly, an insulating layer, such as layer 50 of Mase, should be non-porous so as to avoid the possibility of current leakage." See Answer, page 4.

Although the appellants have stated that, "Mase does not teach that the electrically insulating layer 54 is more porous (or even less porous) than the adjacent layers; rather Mase is silent on this point," Brief page 4, and the appellants further state, "that the claims differ from Mase '456 to the extent they call for the boundary layer to have an average sintered particle size larger than or different from those of the electrolyte layer and insulating layer is an artifact from a previous rejection, at which point the claims specified more broadly that the average sintered boundary layer particle size is larger than that of the electrolyte substrate layer but simply different than that of the insulating substrate layer", Footnote 2, Brief page 5, on the record before us there is no direct challenge to the examiner's findings that it is common knowledge that a solid electrolyte layer is non-porous and that similarly an insulating layer should be non-porous. Accordingly, we accept the examiner's finding as fact that both the electrolyte layer and the insulating layer of Mase

are non-porous and layers corresponding to the boundary layers of the claimed subject matter are preferably porous.

The examiner recognized however, that there is no disclosure of any relationship between porosity and the particle size difference required by the claimed subject matter. See Answer, page 3. Accordingly the reference to Suzuki, likewise directed to an oxygen concentration detector for testing exhaust gas from an automobile was relied upon for its coating of porous refractory metal oxides. See column 1, lines 5-8 and 46-54. Specifically, Suzuki teaches a relationship between porosity and particle size, wherein courser grains of alumina have substantially greater porosity and correspondingly larger particle sizes than finer grains of alumina. See column 2, lines 38-53. We conclude therefrom that porous particles of refractory metal oxides have larger particles than less porous particles and likewise have larger particle sizes than corresponding electrolytic particles and insulating particles which are not disclosed as being porous.

Based upon the above findings and analysis, we conclude that the examiner has established a *prima facie* case of obviousness with respect to the claimed subject matter.

As a rebuttal to the *prima facie* case of obviousness, appellants rely on the disclosure of two articles to show lack of correlation between porosity and particle size. The first is a published article entitled "High Purity/Fine Alumina" by Sumitomo Chemical Company. The second is an article entitled "Development of Advanced Alumina 'SUMICORUNDUM'." Having reviewed the data present, we conclude that appellants have not met their burden of showing unexpected results, i.e., a lack of correlation

between porosity and particle size. *In re Klosak*, 455 F.2d 1077, 1080, 173 USPQ 14, 16 (CCPA 1972). It is not sufficient to assert that the results obtained are unusual or unexpected. The burden of showing unexpected results rests on those who assert them.

Appellants rely on a comparison between alumina compositions designated as AKP-20, AKP-30 and AKP-3000 on page 2 of the Sumitamo article. It is their position that, "the product AKP-3000 has an average sintered particle size (0.55μ) that is smaller than that of the product AKP-20 (0.57μ), whereas AKP-3000 has a significantly lower fired density, and therefore a significantly higher fired porosity than AKP-20." See Brief, pages 6 and 7. We disagree with both appellants' analysis and conclusion.

We find that the sintering properties of AKP-20, AKP-30 and AKP-3000 powders are compared in a Table at page 2 of the article. The initial particle size in μm of AKP-20 is 0.4~0.6, AKP-3000 is 0.4~0.7, and for AKP-30 0.3~0.5. Each of the powders is sintered at 1600°C. See footnote 2, right-hand column of page 2. As the particle size of AKP-30 is smaller than that of either AKP-20, or AKP-3000 one would expect that the sintered properties would disclose a smaller mean particle size and such is the case. As for the comparison between AKP-20 and AKP-3000, we find little distinction in the fired density, 3.97 for AKP-20 and 3.98 for AKP-3000. Furthermore, we find only minimal distinctions between the initial particle size distribution which differs only by 0.1μm and the final mean particle size distribution which differs by a substantially smaller amount, 0.02μm. Based upon our findings, we conclude that the distinctions between AKP-20 and AKP-3000 are minimal and fail to reflect any significant distinction in porosity between sintered

fine alumina powders. Furthermore, it is duly noted that porosity is not directly discussed in the Sumitomo publication.

With respect to the article on "Sumicorundum" discussed by the appellants in the Brief on page 7 of the Brief, for which only a very partial and minimal translation has been submitted, appellants essentially present only the conclusions reached in the article. In particular, there is no disclosure of the particle size or particle size distribution utilized by the authors in "Sumicorundum." Accordingly, we are unable to determine the quantification of the terminology of, "having a wide-spread particle distribution," or having "a sharp particle size distribution with less micro particles." See partial translation of "Development of Advanced Alumina 'SUMICORUNDUM'," page 1. Therefore, little, if any weight can be accorded the conclusion reached therein.

Accordingly, based on our consideration of the totality of the record before us, and having evaluated the *prima facie* case of obviousness in view of appellants arguments and evidence, we further conclude that the preponderance of evidence weighs in favor of obviousness of the claimed subject matter within the meaning of § 103. See *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992).

DECISION

The rejection of claims 1, 2 4, 6, 7, 10, 11, and 18 through 22 under 35 U.S.C. §103(a) as being unpatentable over Mase in view of Suzuki is affirmed.

The decision of the examiner is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED

TERRY J. OWENS
Administrative Patent Judge

PAUL LIEBERMAN
Administrative Patent Judge

JAMES T. MOORE
Administrative Patent Judge

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